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REMARKS

Claims 1-40 were pending. Of these, claims 1-17, 20-37 and 40 were rejected. Claims 18, 19, 38 and 39 are indicated as allowable if rewritten independent form including all of the limitations of the base claim and intervening claims. The Applicants gratefully acknowledge the Examiner's consideration of the Applicants' previous amendments and arguments which resulted in removal of all of the prior grounds for rejection. As explained below, the Applicants respectfully submit the present claims are allowable over the new grounds for rejection presented in the office action mailed on September 24, 2007. No new amendments have been entered with this paper. The Applicants respectfully request further examination and reconsideration in view of the remarks below.

Rejections under 35 U.S.C. § 103:

Claims 1-2, 4-8, 13-17, 20-22, 24-28, 33-37 and 40 were rejected under 35 U.S.C. § 103 as allegedly being obvious over previously-cited, U.S. Patent No. 5,993,038 to Sitbon et al. (hereinafter "Sitbon") in view of newly-cited, U.S. Patent No. 6,574,669 to Weaver et al. (hereinafter "Weaver"). Particularly, regarding independent claims 1 and 21, the office action alleges that Sitbon discloses: "a method of determining a placement of services of a distributed application onto nodes of a distributed resource architecture" (in its Abstract, lines 1-5 and 9-14, and in col. 1, lines 6-8); "forming communication constraints" (in col. 4, lines 62-64 and col. 5, lines 4-7); "comprising a product of a first placement variable" (in col. 4, lines 66-67); "a second placement variables" (in col. 4, lines 62-64); "forming an objective" (in col. 3, line 66, to col. 4, line 4); and "employing a local search solution to solve an integer program comprising the communication constraints and the objective, which determines the placement of the services onto the nodes" (in col. 3, line 66, to col. 4, line 4 and col. 4, line 62, to col. 5, line 9). The office action alleges that the equation at col. 5, lines 62-64, of Sitbon "is the solution for an integer program, in that a summation of constraint is determined by the application of the relevant machine." The office action further states that Sitbon is silent on "said communication constraints being between node pairs which ensure that a sum of transport demands between a particular node pair does not exceed a transport capacity

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between the particular node pair." However, the office action alleges that Weaver discloses these features (in its Abstract, lines 1-8 and in col. 5, line 63, to col. 6, line 13) and that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Sitbon by using communication constraints between node pairs to ensure that a sum of transport demands between a particular node pair does not exceed a transport capacity between the particular node pair as taught by Weaver in order to achieve an effective utilization of network links, and balance network traffic loads between links, using linear optimization (Weaver: Col. 4, ln. 25-37))."

The Applicants respectfully traverse the rejection. As explained fully below, the Applicants respectfully submit that it would not have been obvious to combine Sitbon and Weaver in the manner suggested in the office action, and, even if combined, the Sitbon and Weaver references do not teach or suggest all of the limitations of applicants' claims 1 and 21.

Sitbon is directed toward balancing the load of a distributed application among machines of a distributed processing system. A tool disclosed by Sitbon includes a master daemon running on one of the machines and a plurality of agent daemons running on other machines. The master and each of the agents calculate the load of the machine on which they are running. The master collects all of the load data and sends the data to all of the agents. At the request of the distributed application, the local agent closest to the application indicates to the application which machine has the lightest load. The application then requests the machine with the lightest load to execute the services the application requires. See Abstract of Sitbon and col. 3, line 66, to col. 4, line 4.

Weaver discloses a method and an apparatus for routing packets within a computer network using linear optimization techniques to distribute packet traffic over all potential links between a source and a destination node within the network. Network traffic is allocated to links coupled to a source node in a manner that is proportional to the bandwidth of links across complete paths which are fed from such links coupled to the source node. A set of metrics, in the form of complex numbers, is determined for a predetermined set of links within the network. The metrics are arranged as a matrix, and a linear optimization operation is performed using the matrix to determine percentage traffic distribution over links coupling the source node and the destination node in the

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network. Routing tables are then established to route traffic within the network according to the percentage values resulting from the linear optimization operation. Abstract of Weaver.

"Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented." *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966). *See also, KSR Intl. Co. v. Teleflex Inc.*, 550 U.S. ___ (2007). Moreover, in order to properly reject a patent claim under 35 U.S.C. § 103, the claimed subject matter must be considered as a whole. *See* 35 U.S.C. § 103. When these principles are followed, it is apparent that the Applicants' claimed invention is not obvious in view of the cited references.

In order to properly combine the references, there must be some reason that a person of ordinary skill in the art would make the combination. Here, Sitbon is directed toward balancing a load of a distributed application by selecting a machine having the lightest load for assigning a required service. Weaver is directed toward routing packets in such a way as to distribute communication traffic in a communications network. Therefore, Sitbon and Weaver are clearly directed toward different problems and present solutions that are unrelated to each other. Particularly, Sitbon assigns a service to a node having a lightest load, whereas, Weaver routes packets to distribute traffic. For at least this reason, it would not have been obvious to combine Sitbon with Weaver.

Further, there is not a teaching in either reference that Sitbon would benefit from the teachings of Weaver. Specifically, Sitbon teaches that the load for each machine is calculated using a formula that takes into account the utilization of the network by the node. See Sitbon at col. 4, line 62, to col. 5, line 15. Therefore, because Sitbon already takes network loading into account, there would not be a reason to look toward Weaver for routing communications traffic.

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There is also no teaching in Sitbon or Weaver as to how Sitbon might make use of the traffic routing method of Weaver. This is clear because Sitbon only looks to the comparative loading on the machines to determine which machine has the lightest load and, thus, should receive an additional assignment of services to be executed. There is no teaching or suggestion in either reference as to how the traffic routing of Weaver might be used to determine which machine of Sitbon has the lightest load or which machine should receive an additional assignment of services.

For at least these reasons, the Applicants respectfully submit that Sitbon and Weaver are not properly combinable. Therefore, claims 1 and 21 are allowable over Sitbon and Weaver.

Further, the applicants respectfully submit that even assuming that Sitbon and Weaver could be properly combined, such a combination does not disclose all of the limitations of applicants' claim 1 or 21.

The Applicants' invention, as recited in the independent claims, is a novel method of determining a placement of services of a distributed application onto nodes of a distributed resource infrastructure including steps of forming and solving an integer program. Particularly, claims 1 and 21, recite "employing a local search solution to solve an integer program comprising the communication constraints and the objective, which determines the placement of the services onto the nodes." The integer program of claims 1 and 21 is formed by the steps of "forming communication constraints..." and "forming an objective...".

Neither Sitbon, nor Weaver, discloses forming or solving an integer program. As the Applicants previously explained in their response mailed on July 25, 2007, in integer program is a type of optimization problem in which integer variables are defined, one or more constraints are applied and values for the variables are determined in an effort to maximize one or more objectives. Integer programs are described in the literature. See, for example, "A Comparison of Two Methods for Solving 0-1 Integer Programs Using a General Purpose Simulated Annealing Algorithm" by Abramson, et al. and "Domain-Independent Local Search for Linear Integer Optimization" by Walser, both of which were cited by the applicants in the Information Disclosure Statement submitted on July 25, 2003.

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  The office action alleges that the equation at col. 5, lines 62-64, of Sitbon "is the solution for an integer program, in that a summation of constraint is determined by the application of the relevant machine." The Applicants respectfully disagree. Rather, this reasoning is flawed at least because it is inconsistent with the plain meaning of the claim. While the Office may interpret claim language broadly, this interpretation must be consistent with the meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in Applicants' specification. Here, the Applicants respectfully submit that the plain meaning of the term "integer program" that would be understood by a person of ordinary skill in that art in light of the Applicants' specification is a type of optimization problem in which integer variables are defined, one or more constraints are applied and values for the variables are determined in an effort to maximize one or more objectives. The Applicants respectfully submit that an interpretation of the term "integer program" which encompasses the cited equation of Sitbon, as suggested in the office action, is not reasonable because it is inconsistent with the plain meaning of the term as it would be understood by those skilled in the art and because it is inconsistent with the way the term is used in the Applicants' specification.

  When interpreted correctly, it is clear that Sitbon does not disclose or employ an "integer program." The office action relies upon Sitbon at col. 3, line 66, to col. 4, line 4; col. 4, line 62, to col. 5, line 9 and col. 5, lines 62-64 as allegedly disclosing the step of Applicants' claims 1 and 21 which employ an integer program. However, at col. 3, line 66, to col. 4, line 4, Sitbon merely states that the estimated load for each of the machines is used to deduce the machine with the lightest load. At col. 4, line 62, to col. 5, line 9, Sitbon provides a mathematical formula by which it calculates the total load of an agent using a percentage of utilization of the central processor of the agent, a percentage of utilization of the memory of the agent, a percentage of utilization of the network by the agent, a percentage of utilization of the memory of the agent, and a percentage of utilization of input/output units by the agent, each being weighted by specific weighting factors whose sum is equal to one. Thus, each load is calculated from a weighted sum and the loads are then compared to determine which is lightest. There is no teaching or

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suggestion in Sitbon that such a determination is made using integer programming techniques. Rather, this equation of Sitbon is used to calculate a weighted sum of inputs; it is not a solution to an integer program. Finally, at col. 5, lines 62-64, Sitbon discusses the use of a "correction factor" and "power coefficient" which relates to the power, size and type of the machines. This also does not disclose the use of an integer program.

Weaver also does not disclose an integer program. While Weaver discloses linear optimization and linear programming, it does not suggest or disclose the use of an integer program. See, Weaver at col. 4, lines 9-24. Moreover, the linear programming is used by Weaver for routing packets in such a way as to distribute communication traffic in a communications network. See Abstract of Weaver. Accordingly, Weaver does not suggest or disclose the limitations of Applicants' claims 1 and 21 that are missing from Sitbon.

Therefore, this is another reason why claims 1 and 21 are allowable.

The Sitbon and Weaver references also do not teach or suggest how such an integer program that includes both the recited communication constraints and the recited objective might be employed to determine the placement of the services onto the nodes. Sitbon teaches that when additional services are required by the distributed application, all of those services are assigned to the one machine that has the lightest load. In order to place different services onto a different machine, the calculation of which machine has the lightest load would need to be repeated. In contrast, the applicants' invention as recited in claims 1 and 21 recites that the solving of the integer program places multiple services onto multiple nodes. This is another reason why claims 1 and 21 are allowable.

The cited references also do not disclose other limitations recited by Applicants' claims. For example, claims 1 and 21 recite that the "sum of transport demands" is determined by "each term of the sum comprising a product of a first placement variable, a second placement variable and the transport demand between the services associated with the first and second placement variables." The office action relies upon Sitbon at col. 4, lines 62-64, as disclosing that the "total load is the transport demand." The Applicants respectfully disagree. While W3 of Sitbon reflects a "ratio between the number of pieces of information sent and received by the agent and the maximum allowable rate in the network," Sitbon discloses that this as a cumulative communication demand between a

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particular agent and <u>all</u> other agents. In contrast, claims 1 and 21 require that each term of the sum of transport demands reflects transport demand between <u>pairs</u> of services. This is another reason why claims 1 and 21 are allowable.

Similarly, to claims 1 and 21, independent claims 2, 20, 22 and 40 also require an integer program. Specifically, these claims each recite "forming an integer program" that includes placement variables, communications constraints and an objective and "employing a local search solution to solve the integer program which determines the placement of the services onto the nodes." As explained above, neither Sitbon, nor Weaver, discloses forming or solving an integer program. The Applicants respectfully submit that the Sitbon and Weaver references also do not teach or suggest how such an integer program that includes the recited placement variables, communication constraints and the recited objective might be employed to determine the placement of the services onto the nodes, as is required by Applicants' claims 2, 20, 22 and 40.

In addition, as explained above, the Applicants respectfully submit that the Sitbon and Weaver references are not properly combinable. This is at least because Sitbon and Weaver are directed toward different problems and present solutions that are unrelated to each other. Particularly, Sitbon is directed toward balancing a load of a distributed application by selecting a machine having the lightest load for assigning a required service, whereas, Weaver is directed toward routing packets in such a way as to distribute communication traffic in a communications network. Further, there is not a teaching in either reference that Sitbon would benefit from the teachings of Weaver. Specifically, because Sitbon already takes network loading into account, there would not be a reason to look toward Weaver for routing communications traffic. There is also no teaching in Sitbon or Weaver as to how Sitbon might make use of the traffic routing method of Weaver. This is clear because Sitbon only looks to the comparative loading on the machines to determine which machine has the lightest load and, thus, should receive an additional assignment of services to be executed. There is no teaching or suggestion in either reference as to how the traffic routing of Weaver might be used to determine which machine of Sitbon has the lightest load or which machine should receive an additional assignment of services.

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The cited references also do not disclose other limitations recited by Applicants' claims. For example, claims 2, 20, 22 and 40 recite that the "placement variables" indicate whether a particular service is located on a particular node. The office action states that the variables disclosed at col. 4, line 62, to col. 5, line 9, of Sitbon are such "placement variables." The Applicants respectfully disagree. Rather, W1, W2, W3 and W4 of Sitbon are percentages of utilization and k1, k2, k3 and k4 of Sitbon are weighting factors. None of these are "placement variables" which indicate whether a particular service is located on a particular node.

For at least these reasons, the Applicants respectfully submit that claims 2, 20, 22 and 40 are allowable over Sitbon and Weaver, taken singly, or in combination. Claims 4-8, 13-15, 16-19, 24-28, 33-36 are allowable at least because each of these claims depends on an allowable base claim 2 or 22.

Claims 9-11 and 29-31 were rejected under 35 U.S.C. § 103 as allegedly being obvious over Sitbon in view of Weaver and further in view of U.S. Patent No. 5,878,224 to Smith (hereinafter "Smith"). The applicants respectfully traverse the rejection. First, claim 9-11 and 29-31 are dependent on allowable base claims. For at least this reason, claims 9-11 and 29-31 are allowable. Second, the rejection relies upon the combination of Sitbon and Weaver as it basis. As explained above, Sitbon and Weaver are not properly combinable. Smith does not cure this deficiency in Sitbon and Weaver. Accordingly, Sitbon and Weaver are also not combinable with Smith.

Regarding claims 9 and 29, the office action states that Sitbon and Weaver are "silent on the processing demands and the processing capacities are normalized according to a processing criterion." However, the office action alleges that Smith discloses this feature in its Absract and at col. 11, lines 18-29. The office action further alleges that "[i]t would have been obvious ... to modify the teachings of Sitbon and Weaver by normalizing the processing demands and processing capacities of a node as taught by Smith in order to avoid pushing the total load of a server beyond what it can handle (Smith: Col. 11, ln. 18-28) for the purposes of avoiding errors and packet loss." The Applicants respectfully disagree with this reasoning. Even assuming that Smith discloses the limitations that it is alleged to disclose, there is no logical connection between the alleged motivation (i.e. avoiding errors and packet loss) and the offered modification (i.e.

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normalizing processing demands and processing capacities). In other words, the Applicants respectfully submit that a person would not anticipate that normalizing processing demands and processing capacities would result in avoidance of errors and packet loss. Therefore, the Applicants respectfully submit that this is another reason that claims 9 and 29 are allowable. This is also another reason that claims 10, 11, 30 and 31 are allowable, being dependent on claim 9 or 29.

Claims 12 and 32 were rejected under 35 U.S.C. § 103 as allegedly being obvious over Sitbon in view of Weaver and Smith and further in view of U.S. Patent No. 6,928,482 to Ben Nun et al. (hereinafter "Ben Nun"). The applicants respectfully traverse the rejection. First, claim 12 and 32 are dependent on allowable base claims. For at least this reason, claims 12 and 32 are allowable. Second, the rejection relies upon the combination of Sitbon, Weaver and Smith as it basis. As explained above, Sitbon, Smith and Weaver are not properly combinable. Ben Nun does not cure this deficiency in Sitbon, Weaver and Smith. Accordingly, Sitbon, Weaver and Smith are also not combinable with Ben Nun.

Conclusion:

In view of the above, the Applicants submit that all of the pending claims are now allowable. Allowance at an early date would be greatly appreciated. Should any outstanding issues remain, the Examiner is encouraged to contact the undersigned at (650) 968-0410 so that any such issues can be expeditiously resolved.

Respectfully Submitted,

Dated: Dec 19, 2007
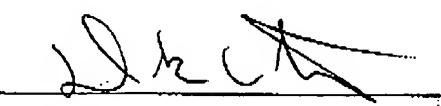
Derek J. Westberg (Reg. No. 40,872)

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